

CLAIMS

What is claimed is:

1. A process for the production of a copolymer of vinyl alcohol (VOH) and 2-acrylamido-2-methyl propane sulfonic acid or a salt of such acid (AMPS) by steps including continuously feeding with agitation, vinyl acetate (VAM) and AMPS as comonomers, a free radical yielding polymerization initiator, and a solvent for said comonomers, initiator, and copolymer resulting from the copolymerization of said comonomers, maintaining the resulting reaction mass in said first reaction zone under polymerization conditions for a residence time sufficient for a major proportion of AMPS fed to said first reaction zone to polymerize, continuously feeding reaction mass from said first reaction zone with an additional supply of AMPS to a second reaction zone, maintaining the reaction mass in the second reaction zone for a residence time sufficient to polymerize a major proportion of the AMPS added to the second reaction zone, continuously withdrawing reaction mass from the second reaction zone, separating copolymer of VAM and AMPS from the latter reaction mass, and saponifying by hydrolysis and/or alcoholysis a major proportion of the acetate groups in said copolymer to form a copolymer of VOH and AMPS.
2. The process of Claim 1, wherein up to 0.2 wt. % of acetaldehyde (AcH) is continuously fed to the first reaction zone, based on the total of VAM and ACH being fed.
3. The process of Claim 1, wherein said solvent is methanol, ethanol or propanol.
4. The process of Claim 3, wherein said solvent is methanol.
5. The process of Claim 1, wherein the total amount of AMPS fed to both reaction zones is about 1 to about 20 wt. % based on the total of VAM and AMPS being fed.
6. The process of Claim 5, wherein said total amount of AMPS is about 4 to about 15 wt. %.
7. The process of Claim 1, wherein the amount of said solvent fed to the first reaction zone is about 10 to about 40 wt. % based on the weight of VAM being fed.
8. The process of Claim 1, wherein the average residence time in the first and second reaction zones of the components fed to the said reaction zones is about 30 to about 120 minutes, for any twelve hour period.
9. The process of Claim 8, wherein said average residence time is about 45 to about 70 minutes.

10. The process of Claim 1, wherein the reaction temperature in said first and second reaction zones is about 55 to about 85°C.

11. The process of Claim 10, wherein said reaction temperature is about 60 to 80°C.

12. The process of Claim 1, wherein the average reaction pressure in each reaction zone is about 1 to about 30 psi.

13. The process of Claim 1, wherein said reaction pressure is about 3 to about 15 psi.

14. The process of Claim 1, wherein the residence times and temperatures in the first and second reaction zone result in the polymerization of substantially all the AMPS fed to the system.

15. The process of Claim 1, wherein the effluent from said second reaction zone has an actual polymer solids content of about 40 to about 85% and the percent conversion calculated from said actual polymer solids content and the theoretical polymer solids content equal to the amount of monomers added to the system is about 70 to about 99%.

16. The process of Claim 17, wherein said percent conversion is about 80 to about 98%.

17. The process of Claim 1, wherein the relative molecular weight of the VAM/AMPS copolymer obtained from the second reaction zone is indicated by a viscosity of a 15 wt. % solution of the copolymer in methanol of about 4 to about 30 cps.

18. The process of Claim 1, wherein the saponified copolymer of VOH and AMPS contains about 1 to about 8 mol % of polymerized AMPS (poly AMPS), about 1 to about 20 mol % of polymerized VAM (PVAc) and about 75 to about 98 mol % of polymerized VOH (PVOH), a degree of hydrolysis of about 70 to at least 99% indicated by C13NMR and a relative molecular weight indicated by a viscosity of a 4% aqueous solution of the VOH copolymer of about 3 to about 30 cps.

19. The process of Claim 18, wherein said saponified copolymer contains about 2 to about 4 mol % of poly AMPS, about 5 to about 10 mol % of PVAc, and about 85 to about 95 of PVOH, said degree of hydrolysis is about 80 to about 95%, and said viscosity of a 4% aqueous solution of the VOH copolymer is about 7 to about 10 cps.

20. A continuous process for making a vinyl acetate/acrylamido copolymer comprising:

- (a) continuously supplying a reaction mixture including vinyl acetate and a more reactive acrylamido comonomer to a reaction zone wherein the vinyl acetate and acrylamido comonomer are at least partially consumed to form an intermediate reaction mixture;
- (b) continuously supplying to the intermediate reaction mixture a stream enriched with respect to the more reactive acrylamido comonomer and copolymerizing the additional acrylamido comonomer with the intermediate reaction mixture to form a vinyl acetate/acrylamido copolymer product; and
- (c) continuously recovering the vinyl acetate/acrylamido copolymer product.